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बूचड़खाने के लिए आधारभूत अपेक्षाएँ

(दूसरा पुनरीक्षण)

Basic Requirements for an Abattoir

(Second Revision)

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भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली–110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.org.in www.standardsbis.in

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Slaughter House and Meat Industry Sectional Committee, FAD 18

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Slaughter House and Meat Industry Sectional Committee had been approved by the Food and Agriculture Division Council.

Though millions of animals like sheep, goats, pigs and cattle are slaughtered every year in the country, the conditions of slaughter houses where these animals are being slaughtered are far from satisfactory requirements. These slaughter houses have not been constructed on modern lines and they do not fulfill the requirements of hygiene, sanitation, public health and of the prevention of cruelty to animals. This standard is being formulated to help in improving the present conditions of slaughter houses and in guiding the construction of new slaughter houses on modern lines especially with a view of facilitating greater utilization of slaughterhouse byproducts.

The fundamental principle of hygiene, as well as economic consideration demand that the slaughtering of animals for human consumption is carried out in establishments specially constructed for the purpose and kept under constant sanitary control. A well designed and constructed structure is needed to systematically pursue slaughter of food animals, the dressing of carcasses and handling of by-products produced thereof. Further, when the process progresses, there is greater risk of contamination of the product. Therefore, prevention is determined by the layout and the flow pattern of the product. Thus, the site of the slaughterhouse must be chosen carefully and designed appropriately. The facilities provided must be suitable for the species to be handled anticipating throughput and kind of operations to be conducted (whether by-products are to be handled in the facility itself or elsewhere).

This standard was first published in 1970 and revised in 1979. The first revision incorporated improved lay-outs, flow diagrams and requirements for installations and plant wastes disposal.

This second revision has been undertaken to incorporate a number of modifications and additions like those of improved layout plans and flow diagrams. In this revision, requirements for location of abattoirs and list of facilities required in an abattoir and requirements for rails for carcasses have been updated. In this revision, list of basic equipments required for slaughter and dressing has been incorporated. Further, requirements for cleaning and sanitation and requirements for meat worker/handlers have also been incorporated. This standard has been formulated based on the inputs received from the Department of Meat Science and Technology, Madras Veterinary College, Chennai, Tamil Nadu and considering ‘Standard design for small-scale modular slaughterhouses (FAO, 1988) and Prevention of Cruelty to Animals (Slaughter House) Rules, 2001 and incorporating various animal welfare practices suggested by PeTA, India.

Animal Welfare Act, 2001 and Prevention of Cruelty to Animal (Slaughter House) Rules, 2001, may be referred to for issues related to humane method of treatment to animals.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard
BASIC REQUIREMENTS FOR AN ABATTOIR
(Second Revision)

1 SCOPE

This standard covers the typical layout plan, hygienic, sanitary, basic requirements for an abattoir for carrying out slaughter of cattle, sheep, goats and pigs.

2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1982 : 2015	Code of practice for ante-mortem and post-mortem inspection of meat animals (*second revision*)
2190 : 2010	Selection, installation and maintenance of first-aid fire extinguishers — Code of practice
6628 : 1972	Specification for slide rails for use in abattoirs
10500 : 2012	Drinking Water — Specification (*second revision*)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 1982 shall apply.

4 LOCATION

The following facilities are considered mandatory in the proposed site for construction of an abattoir:

a) Availability of stock (food animals) in and around the area. It must be located closer to production centre (livestock farms) rather than consumption centres as transport of meat either in refrigerated or non-refrigerated trucks is much easier than transporting live animals, which is a critical determinant of meat quality.
b) Copious supply of potable water (*see* IS 10500) and three phase electricity connection.
c) Adequate facilities for handling the effluent generated.
d) Contiguity with uncongested road and rail network.
e) Proximity to public transport, sufficiently available throughout the day.
f) Freedom from flooding, objectionable odours, smoke, dust or other contamination (industrial area).
g) The site should be away from human dwellings and should be away from airports in order to avoid bird menace.
h) Remoteness from residential dwellings and other developments that might pose a problem of complaints of noise and odour.
j) Ground suitable for good foundations including piling.
k) Finally it must have enough land for possible future expansion.

NOTE — In case the construction is within the municipal limits, plan for construction shall follow the relevant bye-laws prescribed by the municipal authorities of the place.

5 LAYOUT PLAN

5.1 The abattoirs shall have the following essential facilities:

1. Proper transport of animals.
2. Facilities for proper unloading.
3. Holding pens for animals before slaughter (Lairage).
4. Ante mortem inspection facility (*see* IS 1982).
5. Foot dip with disinfectants.
6. Stunning pen/area.
7. Carrying out humane slaughter/Religious - *Jhatka/Halal* methods.
8. Overhead rail system.
9. Slaughter hall to ensure maintenance of strict hygiene during slaughter.
10. Facilities for flaying and dressing and washing of carcasses.
11. Post mortem examination facilities (*see* IS 1982).
12. Hot water washing facilities (82°C).
13. Knife sterilizers.
14. Emergency slaughter hall.
15. Detained and condemned meat room.

16. Movable or permanent working platforms.
17. Wide doors (1.37m/4.5 feet) for free passage of meat carcasses.
18. Knee/elbow/foot operated wash basins.
19. Separate rooms for cleaning gut, stomach and intestines.
20. Stainless steel bins for blood, edible and inedible offals.
21. Storage of fats/hide/pig bristles/horns/hooves, if necessary.
22. Separate demarcation between clean and unclean area.
23. Meat inspector/veterinarian room.
24. Veterinary laboratory.
25. Lockers/rest room/laundry/toilets for meat handlers.
26. Store room.
27. Electrical and machine room.
28. Chilling and freezing rooms.
29. Boiler and steam generators.
30. Isolation pen for sick and suspected animals.
31. Water proof flooring and side walls.
32. Proper drainage with catch basins.
33. Traps and vents for drainage.
34. Good ventilation with adequate lighting.
35. Potable water supply and storage tanks.
36. Effluent treatment plant.
37. Separate place for storing manure.
38. Protection against pest and vermin.
39. Office room, first aid and security room.
40. Facility for vehicle washing.
41. Non-corrodible food grade equipment and instruments.
42. Disposal of condemned carcass/material — Incineration.
43. Rendering plant.
44. Refrigerated or non-refrigerated covered vehicles/trucks for transport of carcass.
45. Dispatch area for finished product.

5.1.1 Typical layout plan and flow diagram for an abattoir for slaughtering cattle are given in Fig. 1 and Fig. 2, respectively. Typical layout plan and flow diagram for an abattoir for slaughtering pigs are given in Fig. 3 and Fig. 4, respectively. Typical layout plan and flow diagram for an abattoir for slaughtering goat and sheep are given in Fig. 5 and Fig. 6, respectively. These figures are for guidance only. The plan may vary depending on shape and size of plot, number of animals to be slaughtered per day and individual requirements of a particular abattoir.

5.1.2 The retail or wholesale market for meat, if required, can be included within the complex itself, the same should be physically excluded from the rest of the establishment in such a manner that the customers have an access only to these sections where such business is transacted.

5.2 Abattoirs shall have an adequate separation between clean and unclean sections, which shall be arranged in such a way that from the introduction of a live animal into the abattoir up to the emergence of meat and offal classed as fit for human consumption, there shall be a continuous process, without any possibility of reversal, inter-section or over lapping between the live animals and meat, and between meat and by-products or waste. Typical flow diagrams for offals and by-products (rendering) are given in Fig. 7 and Fig. 8.

5.2.1 A flow diagram for basic operation of an abattoir is shown in Fig. 9 for information and guidance only. The layout of entire abattoir, as far as possible, should have a forward flow.

5.3 Other Factors Affecting the Layout of the Abattoir and Allied Operations on Site

5.3.1 *Prevailing Winds*

Prevailing winds shall blow from the clean side to the unclean side of the abattoir premises.

5.3.2 *Natural Slope*

Natural slope shall be such that rainwater and runoff from the unclean area shall not flow into the abattoir, nor shall they flow from the unclean to the clean side of the premises.

5.4 Area Required

Generally for a small abattoir (up to 30 000 units/year) the area required will be about 1-2 acres. For a medium plant (50 000 + units/year) about 2-4 acres will be required. A large abattoir handling over 100 000 units annually will require about 4-6 acres of land.

NOTE — Animal unit is a term commonly used to describe the number of animals slaughtered in an abattoir. An animal unit is the equivalent of one adult bovine or two pigs or three calves or five sheep.

6 UNITS IN AN ABATTOIR

6.1 In view of the facilities to be provided (*see* **5.1**), the abattoir shall have the following units:

a) Reception area or resting grounds,
b) Lairages,
c) Slaughter halls,
d) Ancillary accommodation,
e) Isolation block, and
f) Chiller and freezer rooms.

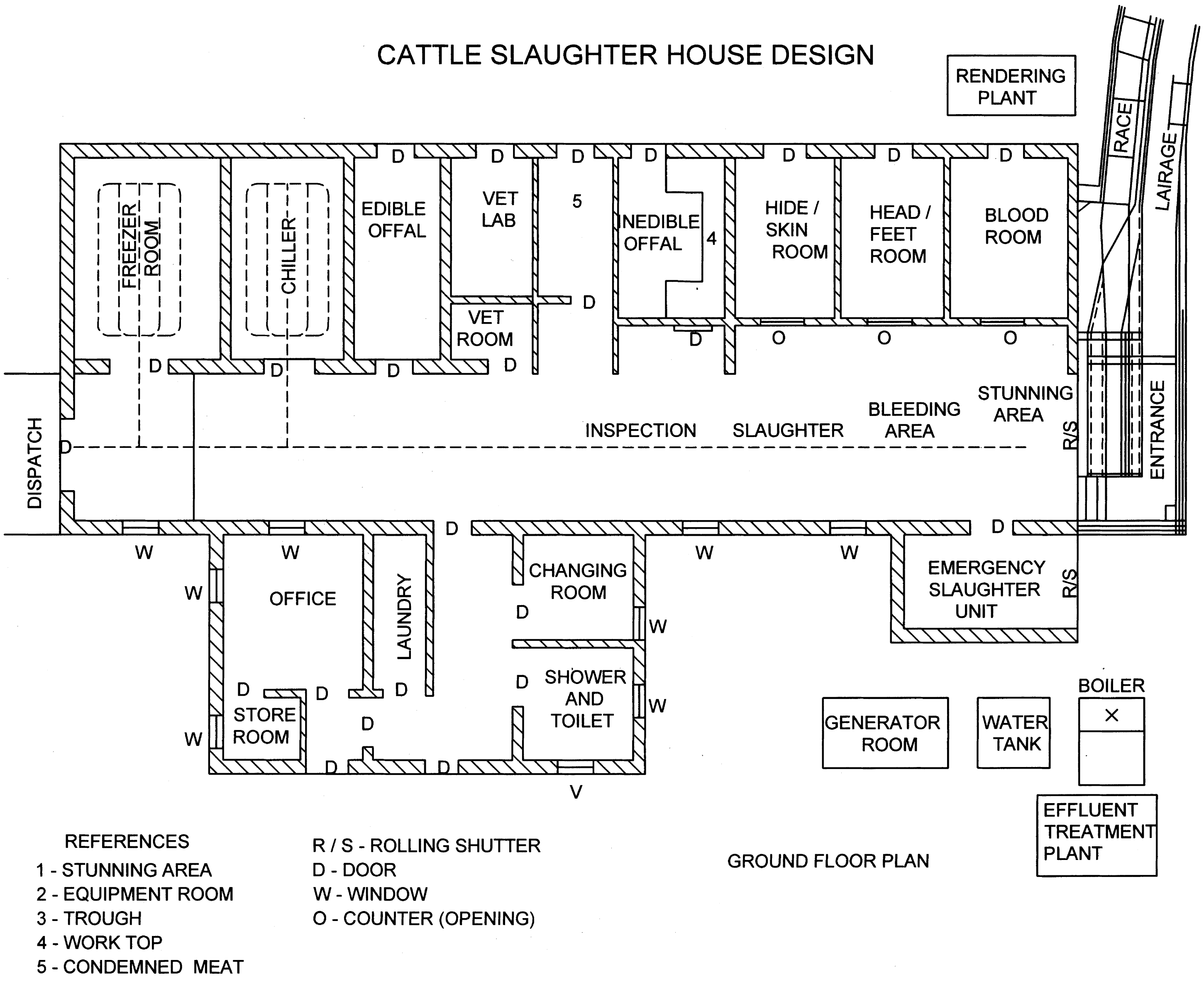
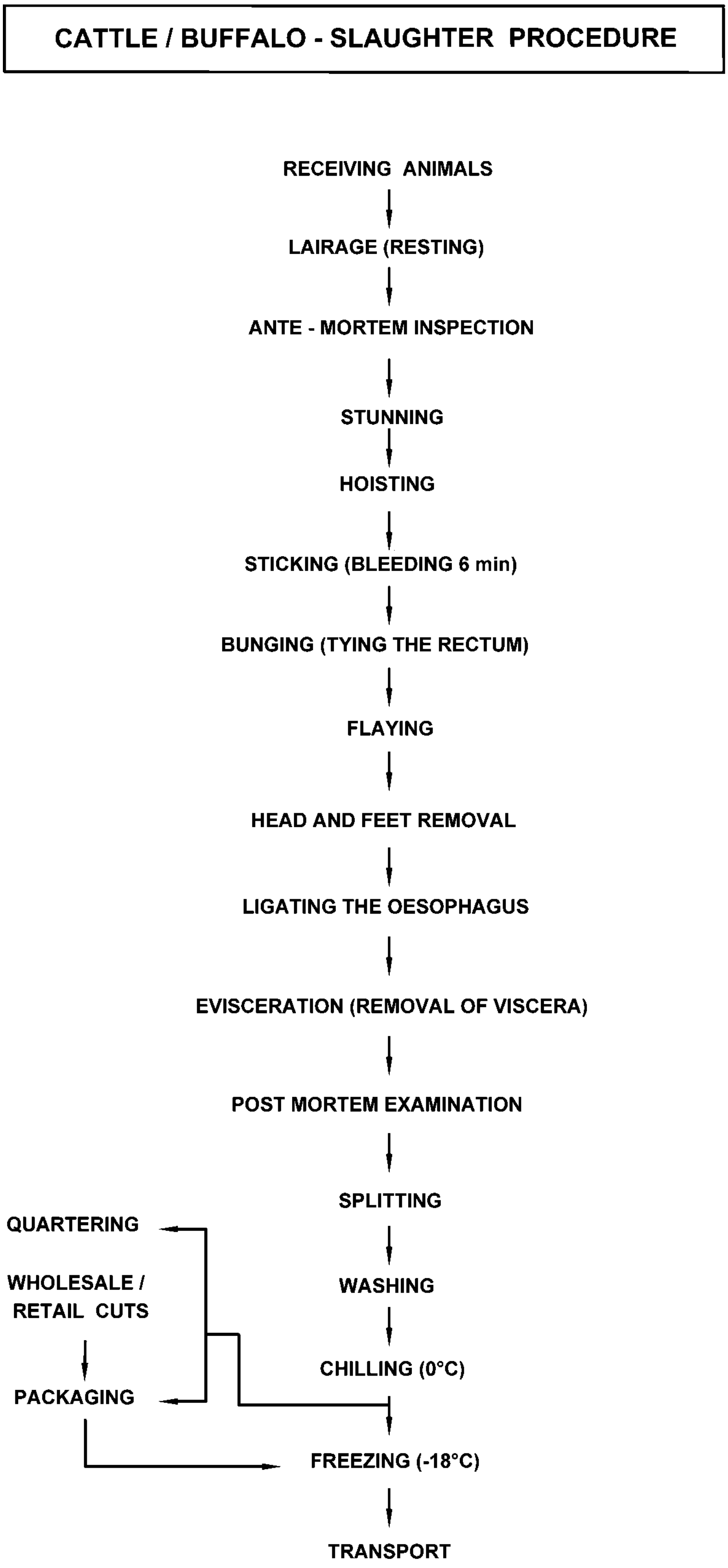
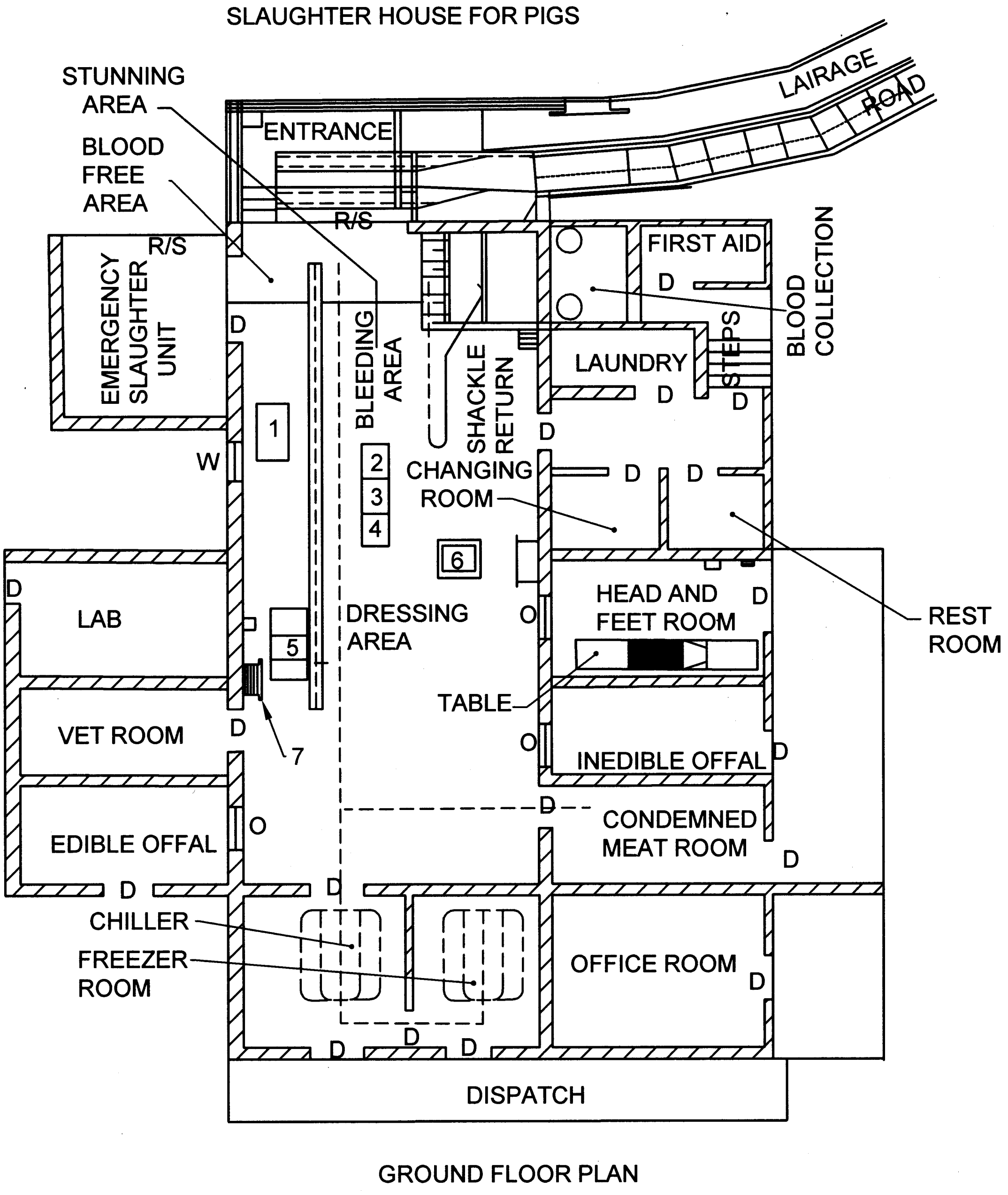


Fig. 1 Typical Layout Plan for Cattle Abattor



NOTE — In *Halal/Jhatka* method of slaughter, the facilities have to be provided for sticking the animals on the floor and hoist to over head rails.

FIG. 2 FLOW DIAGRAM FOR CATTLE ABATTOIR



REFERENCES

1 - SCALDING TANK	7 - HOT WATER HOSE
2 - DEHAIRING	R / S - ROLLING SHUTTER
3 - SINGEING	D - DOOR
4 - DEHEADING	W - WINDOW
5 - SPLIT & WASH	O - COUNTER (OPENING)
6 - OFFAL TROLEY	

FIG. 3 TYPICAL LAYOUT PLAN FOR PIG ABATTOIR

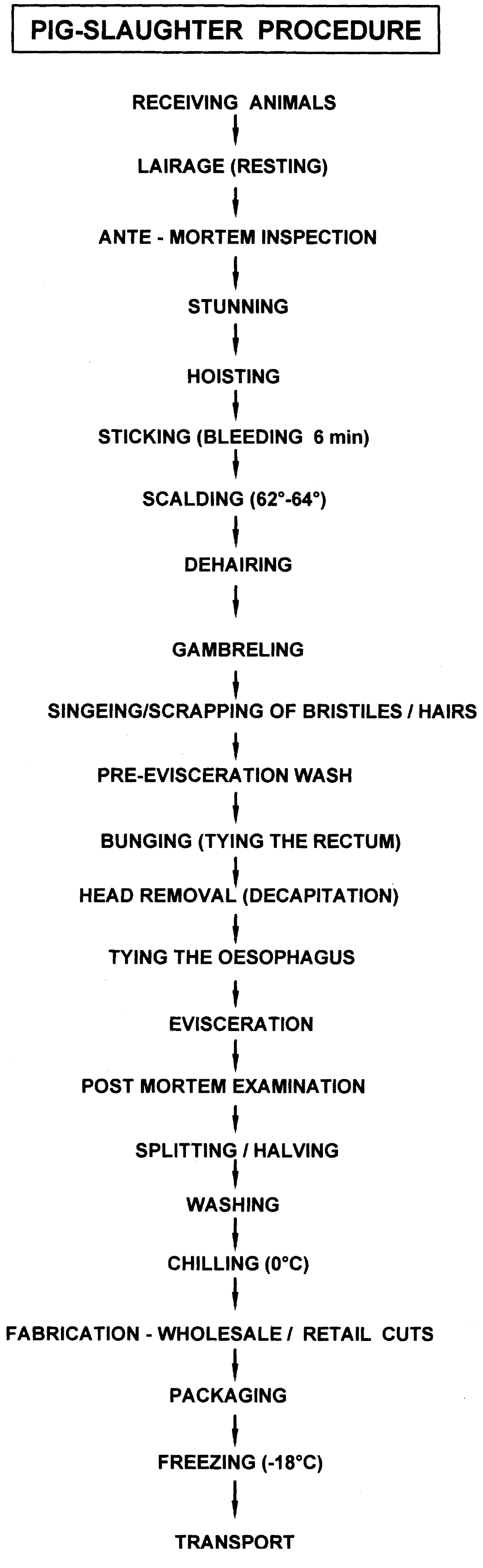


Fig. 4 Flow Diagram of Standard Pig Slaughter Operations

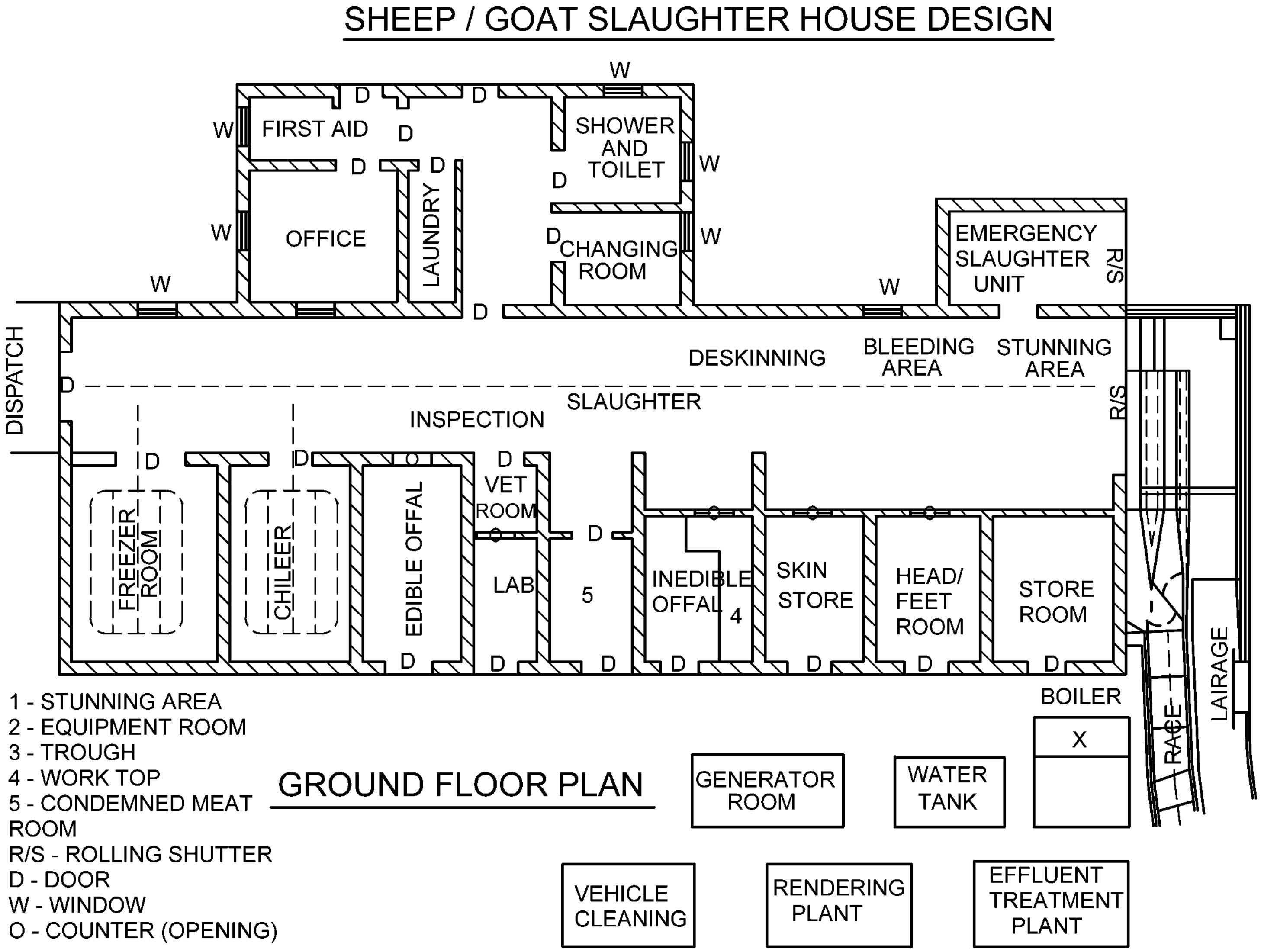
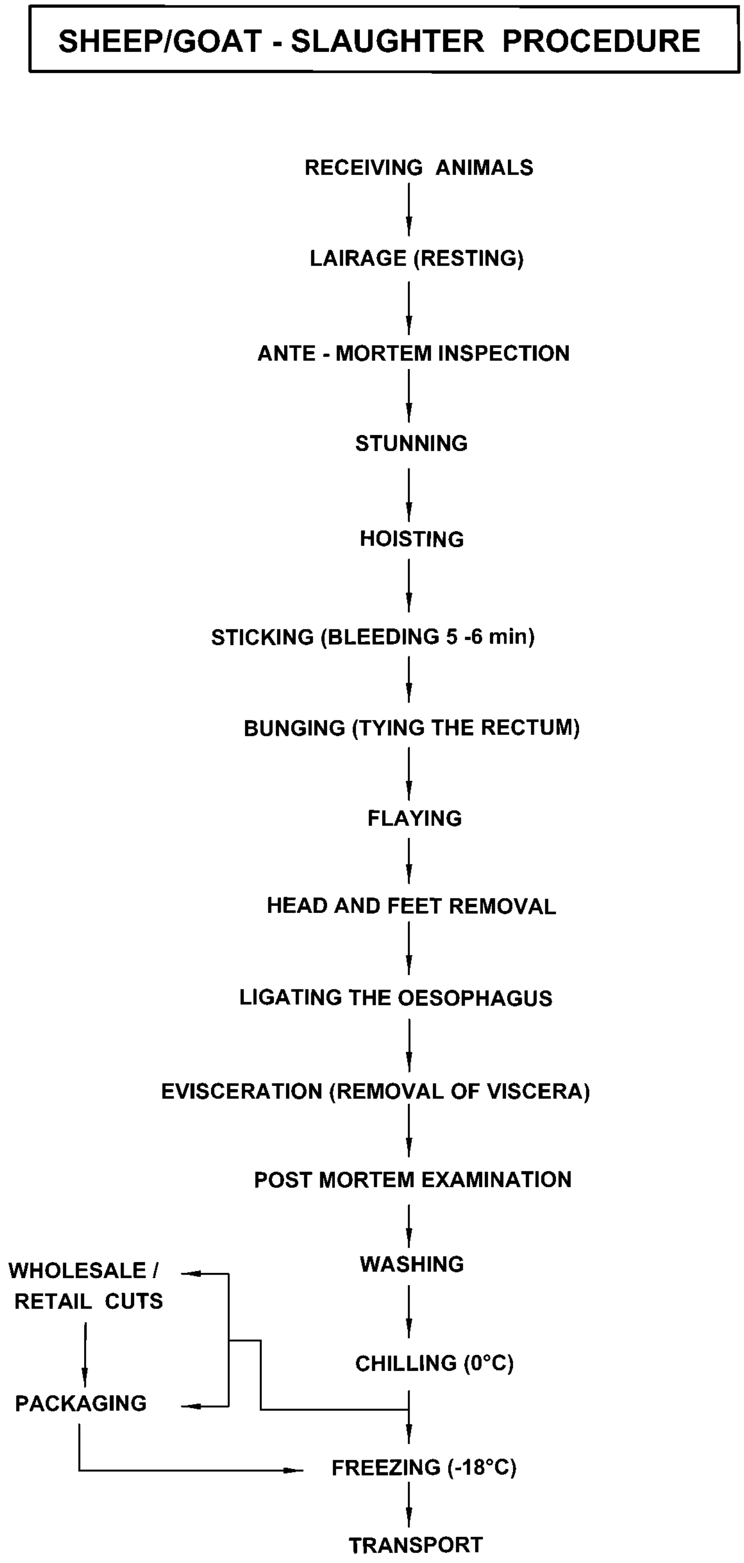


FIG. 5 TYPICAL LAYOUT PLAN FOR GOAT AND SHEEP ABATTOIR



NOTE — In *Halal/Jhatka* method of slaughter, the facilities have to be provided for sticking the animals on the floor and hoist to over head rails.

FIG. 6 FLOW DIAGRAM FOR GOAT AND SHEEP ABATTOIR

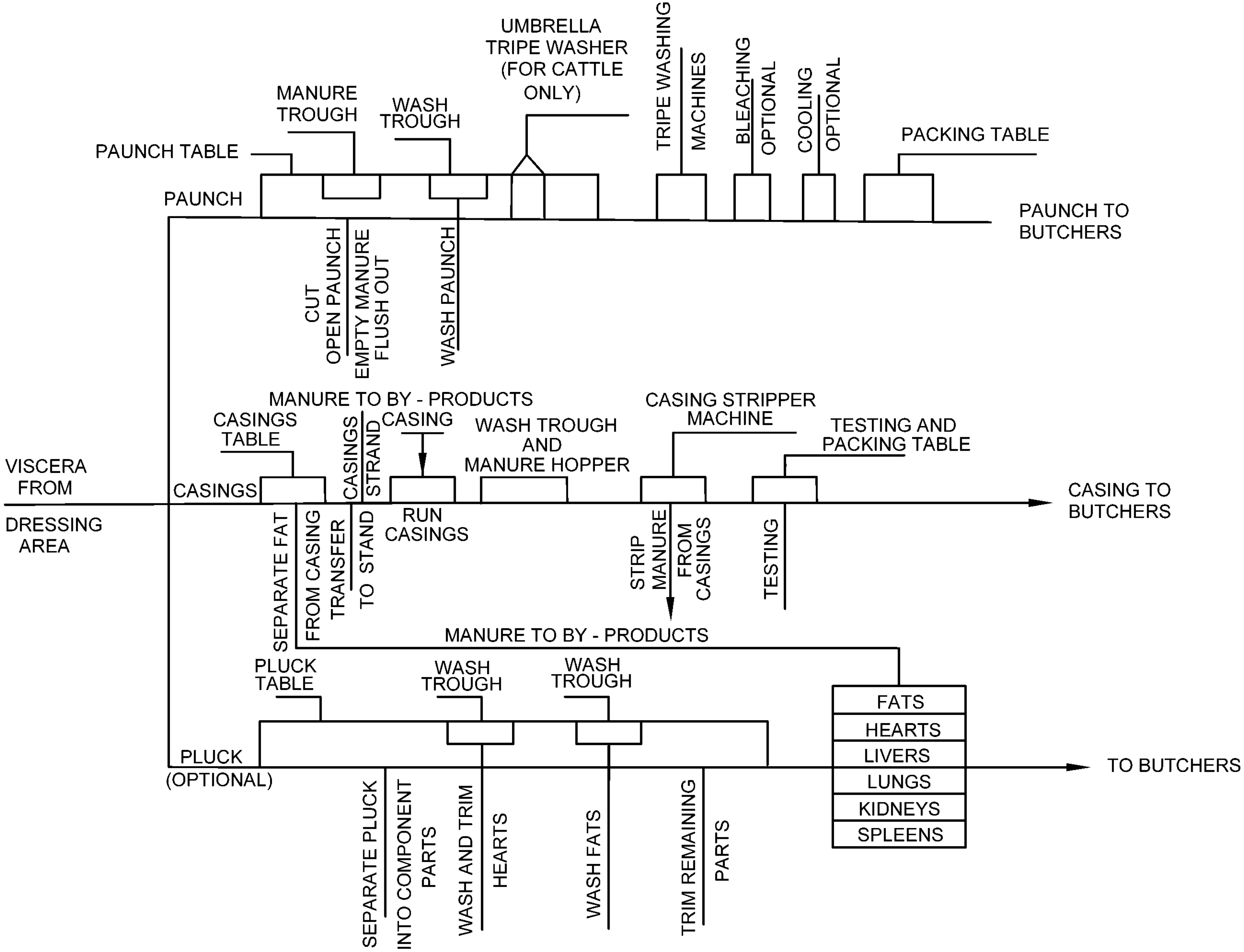


FIG. 7 CATTLE, PIG AND GOAT OFFALS FLOW DIAGRAM

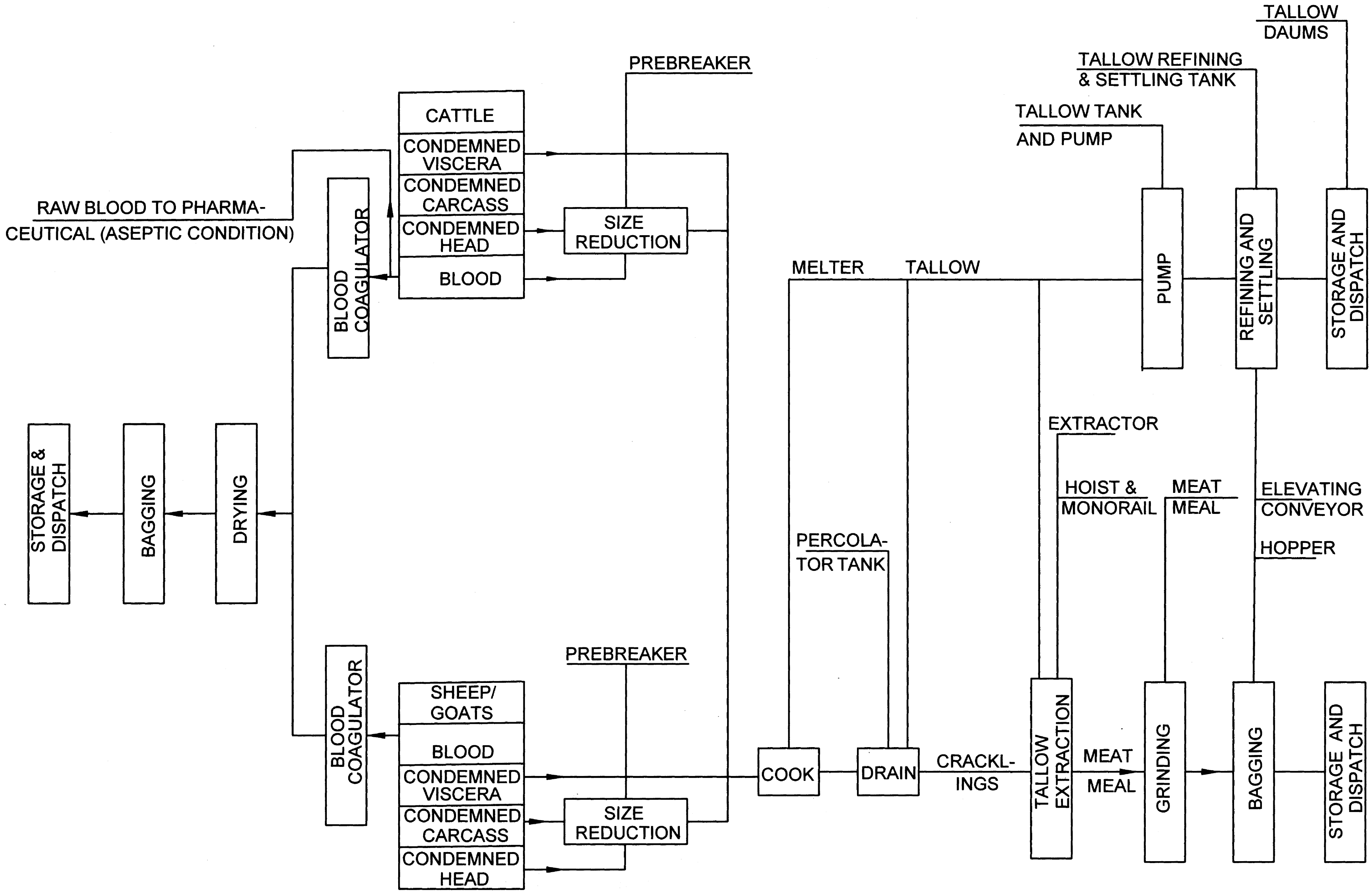


FIG. 8 BY-PRODUCTS (RENDERING) FLOW DIAGRAM

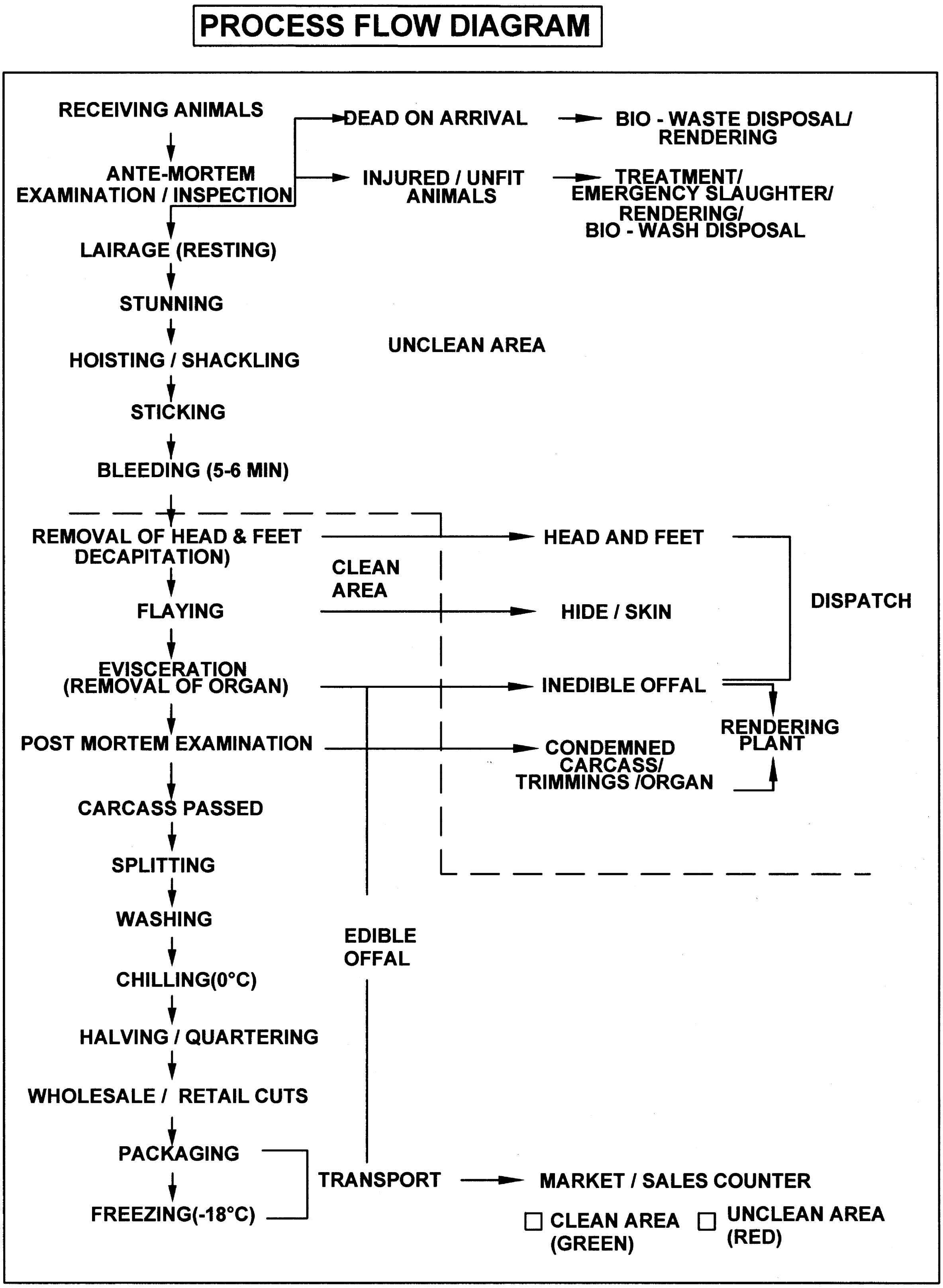


FIG. 9 GENERAL PROCESS FLOW DIAGRAM

6.1.1 *Reception Area or Resting Grounds*

The abattoir shall have reception area of adequate size or resting grounds where the livestock are subjected to veterinary inspection before they are passed on to lairage for resting for 24 h. This shall have the following facilities.

6.1.1.1 *Facilities for unloading ramp*

Unless all animals are arriving on hoof, proper ramps for direct unloading of animals from trucks or railway wagons should be provided. Ramps should be positioned to be even with the vehicle; width should be suitable enough for animals. Ramps should have side protection and non-slip floors and aligned so that there are no gaps where an animal might become trapped and injured. Ideally, animals should not have to walk up or down ramps with slope not greater than 30° to the horizontal (1 in 2.75, or 4 in 11). It is better to use hydraulic loading platforms or hydraulically operated lifting decks on vehicles. The ramps should directly lead to ante-mortem area with office room for veterinary inspector. People handling animals, should follow good animal welfare measures in order to avoid stress, injury or suffering to the animals and protect human safety.

6.1.1.2 The reception area or resting grounds shall have facility for watering and examining animals before sending to holding pens.

6.1.1.3 Separate isolation pens shall be provided with watering and feeding arrangements for: (a) sick animals or animals suspected to be suffering from contagious and infectious diseases, and (b) injured or fractious animals, in order to segregate them from the remaining animals.

6.1.1.4 Adequate holding area shall be provided according to the class of animals to be slaughtere. The holding area shall have water and feeding facilities. The resting grounds should have overhead protective shelters.

6.1.2 *Lairage*

6.1.2.1 Animals should be kept in the lairage without overcrowding or injury or being exposed to climatic stress. The lairage shall be adequate in size for the number of animals to be kept. Space sufficient to house three days supply of cattle and/or two days supply of sheep or pigs is considered necessary. Space provided to animals should be such that the animal can freely move and express its normal behavior patterns as far as possible. The space provided in the pens shall be not less than 2.3 m^2 - 2.8 m^2 per animal for cattle which are kept without tying and not less than 3.3 m^2 per animal for the tied one. The space provided in the pens shall be not less 0.6 m^2 per animal for medium sized pigs and not less than 0.7 m^2 per animal for heavy pigs, calves, sheep and goat.

6.1.2.2 The animals shall be kept separately depending upon their type and class. There shall be no mixing of animals of different species. There shall be separate pens for male and female, horned and polled, animals in heat (oestrous) and pregnant animals.

6.1.2.3 The lairage shall be roofed and so constructed as to protect the animals from extreme climatic conditions like heat, cold and rain to avoid stress. Handling facilities should be designed to ensure ease of handling and to prevent injury to animals. There should be no physical features in the lairage which cause recurring injuries to animals.

6.1.2.4 Floors shall have mild slopes to prevent accumulation of water and prevent water logging. Slurry and manure should be frequently removed from the shelter facilities.

6.1.2.5 Lairage should be maintained dry, clean and free from rodents and insects. The lairage shall have adequate facilities for cleaning and/or drying of animals; adequate supply of clean water for drinking and washing and facilities for feeding whenever necessary; and ante-mortem inspection.

6.1.2.6 Where separate lairage or sections are to be provided for livestock meant for *Jhatka* and *Halal*, complete visual separation shall be effected and entrances shall be as far apart as possible.

6.1.3 *Slaughter Halls*

Separate provisions, wherever required, shall be made in an abattoir for slaughtering, dressing and processing of:

a) sheep and goats (*Halal*);
b) sheep and goats (*Jhatka*);
c) pigs;
d) cattle (*Halal*); and
e) cattle (*Jhatka*).

The slaughter halls and ancillary accommodation thus provided shall be separated, keeping in view the economic and local requirements, by solid walls depending upon the site. Exits to such sections shall be kept as far apart as possible.

6.1.3.1 Separate space shall be provided for stunning (wherever applicable), bleeding and dressing of the carcasses. The curbing should be not less than 150 mm high and 100 mm wide with the top sloped not less than 45°.

6.1.3.2 *Races*

Single-file race should not be too wide, crowded and should not appear as a dead end. Single-file races must be narrow enough to prevent animals from turning around or becoming wedged beside each other. Cattle race should be wide (76 cm) and races for pigs, goats and sheep should have only 3 cm of clearance on each side of the largest animal. Curved race is more efficient because animal entering the race cannot see people or other activity up ahead, provided laid out correctly. Curved races must be laid out so that animals standing in the crowding-pen can see a minimum of three body lengths up the race before it turns.

6.1.3.3 *Stunning area (wherever applicable)*

The area in front of the stunning pen should be at least 3m in width to the opposing wall or bleeding trough and be fitted with upright bars 5cm in diameter and 1.2 m high, spaced in 40 cm intervals for safety purposes. Animals should enter the device easily. If they balk or back up, check for distractions. Animal's vision should be blocked so that they do not see people or suddenly moving objects. Metal shields should be installed around the animal's head on box type restrainers. Animals tend to panic when they lose their footing. Non-slip flooring should be provided in box-type restrainers and a non-slip cleated entrance ramp should be provided on conveyor restrainers. Parts of restraint device that press against the animal's body should move with slow steady motion. Animals should never be left in a stunning box or restraint device but should be stunned slaughtered immediately after entry with rituals or otherwise, as the case may be.

6.1.3.4 Knocking section may be so planned as to suit the animal and particularly the ritual slaughter, if any. It should have facility to slaughter crippled animals brought from ante-mortem inspection area to slaughter department and also the floor and hand washing facilities. An animal shall not be slaughtered in sight of other animals. The knocking section and dry landing area associated with it shall be so built that escape from this section can be easily carried out by an operator without allowing the animal to pass the escape barrier. This may normally be accomplished by an arrangement such as placing vertical pipes 150 mm in diameter, 1.5 m high on prepared vertical pipe inserts, about 120 mm high or the internal diameter of the pipe used for the vertical placed not less than 500 mm apart.

6.1.3.5 A curbed-in bleeding area of adequate size should be provided. The bleeding trough should be at least 1.5 m wide for cattle, possessing a good gradient, side walls of the same height, and two drains, one for blood and one for water for the purpose of cleaning. The length of the bleeding line will depend on the throughput and the system of conveying carcasses, but should be generous, since the majority of blood flow requires 6-8 min. It shall be so located that the blood shall not be splashed on other animals being slaughtered or on the carcass being skinned. Blood drain and collection should be immediate and proper. A floor wash point should be provided for intermittent cleaning. Also a hand-wash basin and knife sterilizer should be provided for the sticker to sterilize knife and wash his hands periodically.

6.1.3.6 *Dressing area*

Dressing of carcasses should not be done on floor. Adequate means and tools for dehiding or skinning of the animals should be provided. Means for immediate disposal of hides or skins should be provided. Hides or skins should be immediately transported either in a closed wheel barrow or by a chute provided with self-closing door. In no case the hides or skins should be spread on slaughter floor for inspection. Floor wash point and adequate number of hand wash basins with sterilizer should be provided in this section. Means for immediate disposal of legs, horns, hooves, etc, should be provided through spring load floor chutes or side wall doors or closed wheel barrows. In case wheel barrows or trucks are used, care should be taken that at no point wheel barrow or truck has to ply under the dressing rails and a clear passage is provided for movement of the trucks.

6.1.3.7 *Viscera inspection facilities*

Adequate space and suitable and properly located facilities shall be provided for inspection of the viscera of the various types of animals slaughtered. This department shall have adequate facilities for hand washing, tool sterilization and floor washing and contrivances for immediate separation and disposal of condemned material. Adequate arrangements may be made for identification, inspection and correlation of carcass, viscera and head.

6.1.3.8 *Carcass washing facility*

A curbed and separately drained area or an area of sufficient size sloped 33 mm/m to a floor drain, where approved carcasses may be washed with a jet of water, should be provided. Carcass should be washed with hot water at > 74°C for at least 10 s. The treatment of carcass with one or more of the following is also permitted for cleaning purpose:

a) Chlorine;
b) Organic acids for example acetic acid, lactic acid, citric acid, fumaric acid;
c) Hydrogen peroxide;
d) Antimicrobials; and
e) Phosphates.

6.1.4 *Ancillary Accommodation*

6.1.4.1 A separate room and hanging space shall be provided for emptying and cleaning of stomachs and intestines. This room shall have a separate exit. Pluck and viscera cleaning and separating departments should be divided into edible and inedible sections for further processing. Those sections should preferably be separated from the slaughter floor, except for one or two connecting doorways provided with solid, self-closing doors, completely covering the opening.

6.1.4.2 Condemned carcasses should be disposed off at rendering plant. If rendering facilities are not provided, the condemned material should be denatured and held in watertight metal containers in suitable inedible product room pending daily removal by contractors for disposal through suitable prescribed waste disposal methods.

6.1.4.3 Suitable and sufficient accommodation shall be provided for the retention of all meat condemned as unfit for human consumption and shall be locked up separately.

6.1.4.4 If a separate block for hide curing or skin drying is not provided in the abattoir, the hides or skins may be stored in a separate room and removed daily.

6.1.4.5 Suitable and sufficient facilities shall be provided for the isolation of meat requiring further examination by the veterinary inspector in a suitable laboratory within the premises of the abattoir.

6.1.4.6 *Veterinary laboratory*

A room equipped for carrying out a trichinoscopic test is compulsory in abattoirs handling pigs. In larger premises, a well-equipped laboratory is essential, not only for the preliminary diagnosis of animal disease but also to maintain the overall hygienic standards.

6.1.4.7 *Veterinary office*

An adequately equipped lockable room for the exclusive use of the veterinarian/meat inspectors. The rooms should be provided with hand-washing and shower facilities, and lockers for clothing (clean and dirty) and meat inspection equipment. A convenient means of cleaning footwear before entry into changing rooms is an advantage.

6.1.4.8 *Labour welfare facilities*

Well located toilet rooms (1 per 15 employees) should be provided in the abattoir building sufficiently away from slaughter walls. A separate hall with lockers and shower facilities (1 per 15 employees) should be provided. Adequate drinking water and washing facilities (cleaning agents, soap and chemicals) should be provided at convenient locations. Adequate facilities for cloak room, canteen with dining hall and first-aid should also be provided. A store room for overalls, equipment and clean manual implements, normally required for the work, must be provided. Hand basins or wash trough with taps controlled preferably with the knee or elbow must be provided at the exit of these facilities.

6.1.5 *Isolation Block*

It is also called as emergency slaughterhouse or miniature abattoir. In large abattoirs isolation block is necessary for detention of suspected animals for its observation and treatment and if necessary to do emergency slaughter in case of fractured, injured animals. The isolation block will have a small lairage to keep 4 cattle with a slaughter hall, cooling hall, bacteriological laboratory, incinerator and sterilization rooms. This block must be located at a distance from the main buildings and workers should not move from here to the main buildings. It should be situated near to the suspect meat detention room and should be in direct communication with the by-products department.

6.1.6 *Chiller and Freezer Rooms*

Chiller room shall have temperature of 0°C to 4°C and freezer room shall have a temperature of –18 ± 2°C. Hanging halls, if air-conditioned should have temperature not higher than 10°C. Two retaining compartments constructed of rust-resistant wire gauge or expanded metal portion extending from about 75 mm above ground to ceiling should be provided, one for holding retained carcasses and the other for holding the carcasses affected with Cysticercus bovis.

7 RAILS FOR CARCASSES

7.1 Any of the following systems for line dressing can be taken into operation, the type depending mainly on the level of throughput, equipment design and species.

7.1.1 *Gravity Rail System*

Recommended for 10-40 animals per hour, carcass is suspended from a spreader and single wheel trolley or runner are gravitated to each station and stopped by a manually operated stop on the overhead rail.

7.1.2 *Intermittent Powered System*

Recommended for 10-75 animals per hour, it involves the mechanical moving of the carcasses suspended on a spreader and trolley along a level rail at intervals by means of a variable timing device which can be pre set to suit the slaughter rate.

7.1.3 *Continuous Powered System*

Recommended for 40-120 animals per hour, here dressing line is in continuous motion with more sophisticated equipment light mechanical hide puller, moving top inspection table and the carcass can be revolved a full 360° while on the rail allowing the operator to work all sides from one position.

7.2 Rails (*see* IS 6628) with hooks of suitable rust-proof metal or mild steel shall be provided for hanging the carcasses and similar provision for plucks shall be made, permitting free circulation of air. The hooks shall be suitably cleaned and sterilized regularly.

7.3 The height and length of rails, provided for bleeding and dressing, shall be in accordance with Table 1.

Table 1 Requirements of Height and Length of Bleeding and Dressing Rails

(*Clause* 7.3)

Sl No. (1)	Carcass (2)	Height cm (3)	Length per Carcass cm (4)
i)	Bleeding rail for sheep, goats and pigs	300[1]	30
ii)	Bleeding rail for cattle/buffalo	450 to 500	50
iii)	Dressing rail for sheep, goats and pigs	230 to 340[2]	—
iv)	Dressing rail for cattle/buffalo	340	—

[1] Falling at the rate of 1 cm/100 cm(for gravity rail).

[2] Remaining dressing rail height shall be 320 cm.

7.4 The space required per carcass and the distance between the rails in hanging or chill room, shall be in accordance with Table 2.

Table 2 Requirements of Space per Carcass and Distance Between Rails in Hanging or Chill Room

(*Clause* 7.4)

Sl No. (1)	Carcass (2)	Space per Carcass cm (3)	Distance Between Rails cm (4)	Heights of Rails cm (5)
i)	Sheep and goats[1]	30	90 to 100	320
ii)	Pigs[1]:			
a)	Weight of pig 70 kg and over	50	90 to 100	320
b)	Weight of pig below 70 kg	30	90 to 100	320
iii)	Cattle/buffalo	80 to 100	90 to 100	320

[1] for sheep, goats and pigs double stacking shall be done.

8 CIVIL CONSTRUCTION

8.1 Abattoir Premises

Should have concrete brick wall with barbed wired fencing upto 10 feet, with security in order to control the unauthorized entry of vehicles, persons and animals. Surfaces on the site must be paved or grassed. Smaller abattoirs must have a surface that is dust and mud free, readily cleanable and well drained. Larger houses should be planted with trees in order to make premises environment friendly. Provision of sufficient storm water drainage should be there. Walkways for staff between the blocks and the abattoir must preferably be roofed. Specific areas such as collection points for manure from holding pens and paunch contents must also be paved and drained.

8.2 Ante-mortem and Pen Area Including Lairage

The area should be paved with impervious material such as concrete non-slippery herring-bone type suitable to stand wear and tear by hooves, or brick, and pitched to suitable drainage facilities. Curbs of impervious material 150 to 300 mm high should be provided around the borders of livestock pen area, except at the entrances. The pen should preferably be covered. The squares in the floors should be 20 cm (8 inch) by 20 cm (8 inch). There should be V shaped grooves in the flooring with minimum depth of 2.5 cm and width of 2.5 cm.

8.3 Plant Building

Materials used shall be impervious, easily cleansable, and resistant to wear and corrosion. Materials such as wood, plaster board, and porous acoustic-type boards, which are absorbent and difficult to keep clean should not be used in edible departments.

8.3.1 *Floors*

The floors should be non-absorbent and non-slippery with rough finish, and shall have suitable gradient for drainage.

8.3.2 *Coves*

Coves with radii sufficient to promote sanitation should be installed at the juncture of floors and walls in all rooms and not less than 100 mm.

8.3.3 *Interior Walls*

Interior walls should be smooth and flat and constructed of impervious materials such as glazed brick, glazed tile, smooth surfaced Portland cement plaster, or other non-toxic, non-absorbent material applied to a suitable base. Walls should be provided with suitable sanitary type bumpers to prevent damage by hand trucks, carcass shanks, and the like. It is recommended that the interior walls should have washable surface up to the height of 2 m from the floor so that the splashes may be washed and disinfected. The smooth walls will be painted in light colours to a height of 3 m.

8.3.4 *Ceilings*

Ceilings should be of good height (5 m or more is desirable in work rooms). So far as structural conditions permit, ceilings shall be smooth and flat. Ceilings shall be constructed of Portland cement plaster, large size cement asbestos boards with joints sealed with a flexible ceiling compound, or other acceptable impervious material and finished so as to minimize condensation, mould development, flaking and accumulation of dirt. The walls (above glazed type portion) and ceiling may be painted with water-resistant paint to maintain them clean.

8.3.5 *Window Ledges*

Window ledges should slope at 45° to promote sanitation. To avoid damage to glass in windows from impact of hand trucks and similar equipment, the window sills should be 1 200 mm above the floor level. Proper ventilation through mechanical venting or through working vents should be provided in the roof structure.

8.3.6 *Doorways and Doors*

Doorways through which product is transferred on rails or in hand trucks shall be at least 1 500 mm wide, except for the doors used in connection with rails, which should be approximately 3 000 mm high can be at least 1 500 mm wide. Doors shall either be of rust-resistant metal construction throughout, or if made with rust-resistant metal having tight soft wood, they shall be clad on both sides with soldered or welded seams. Door jambs shall be clad with rust-resistant metal securely affixed so as to provide no crevices for dirt or vermin and the juncture at which the door joins the walls shall be effectively sealed with a flexible sealing compound.

8.3.7 *Screens and Insect Control*

All windows, doorways, and other openings that may admit flies should be equipped with effective insect and rodent screens. 'Fly chaser' fans and ducts or air curtains shall be provided over doorways in outside wall of food handling areas that are used for dispatch or receiving.

8.3.8 *Rodent-Proofing*

Except in the case of solid masonry walls constructed of glazed tile, glazed brick, and the like, expanded metal or wire mesh, not exceeding 12.5 mm mesh, shall be embedded in walls and floors at their junction. This mesh should extend vertically and horizontally to a sufficient distance to exclude the entrance of rats and other rodents.

8.3.9 *Stairs*

Stairs in edible product handling departments shall be of impervious construction with solid treads and closed risers and shall have side curbs of similar material 150 mm high measured at the front edge of the treads. Floor openings for chutes, etc, and for stairways except at entrances should have curbs of impervious materials, such as concrete or metal, at least 300 mm high, to prevent floor drainage from entering such chutes.

8.4 Vehicular Areas for Trucks

Concrete paved areas, properly drained and extending at least 6 m from building, loading docks or livestock platforms shall be provided at places where vehicles are loaded or unloaded. Pressure washing jets and disinfection facilities for trucks carrying animals should be provided. Vehicles which offload live animals, loads intestines, heads and feet as well as vehicles removing paunch contents, condemned material and refuse are restricted to the dirty area and may not enter areas where meat vehicles and staff who handle meat are to be found. Separate routes for stock and meat vehicles should be provided. Approach roads should be at least 6 m wide. Drainage and cleaning facilities should be available in vehicle parking areas where animals are offloaded or meat is loaded.

8.5 Drainage

8.5.1 All parts of floors where wet operations are conducted should be well drained. Drainage must be from clean to dirty areas. As a general rule, one drainage inlet should be provided for each 37 m^2 of floor space. A slope of about 20mm/m to drainage inlets should be provided for usual conditions. It is important that the floors slope uniformly to drains with no low spots which collect liquid. Floor drains should not be provided in freezer rooms or dry storage areas. When floor drains are installed in rooms where the water seal in traps is likely to evaporate without replenishment, they should be provided with suitable removable metal screw plugs. Special arrangements have to be made for dealing with stomach and intestinal contents, the drains for bovine material to be at least 20 cm in diameter and for the smaller species 15 cm.

8.5.2 *Traps and Vents on Drainage Lines*

Each floor drain, including blood drains, should be equipped with a deep seal trap (I-, U-, or S-shape). Drainage lines shall be properly vented to the outside air and be equipped with effective rodent screens.

8.5.3 *Sanitary Drainage Lines*

Drainage lines from toilet pans and urinals should not be connected with other drainage lines within the plant and may not discharge into a grease catch basin. Such lines shall be installed so that if leakage develops, it shall not affect the product or the equipment.

8.5.4 All floor drains should be so constructed and the floor so made that these can be easily cleaned and then shall be a minimum area to be drained per outlet. It is recommended that 'U' drains set with satisfactory covers should be used and made totally fly-proof and rodent-proof.

8.5.5 *Special Drainage Requirements*

In certain departments, special floor drainage is required. For example, floor drainage valleys are essential under the dressing rails for hogs, calves, and sheep. Such valleys shall be about 600 mm wide and integral with the floor. The valleys shall slope at least 10 mm/m to drains with the valleys. In so-called on the rail cattle slaughtering departments, floor valleys under the dressing rails shall be provided unless the floor drainage is carefully localized within drainage inlets placed advantageously beneath the dressing rails.

9 LIGHTING AND VENTILATION

9.1 Un-refrigerated work rooms should be provided with adequate direct natural light and ventilation or ample artificial light and ventilation by mechanical means. Uncoloured glass having a high transmissibility of light may be used in skylights and windows. The glass area should be approximately one-fourth the floor area of a workroom. This ratio should be increased where there are obstructions, such as adjacent buildings, overhead catwalks, and hoists, which interfere with the admittance of direct natural light. Well distributed artificial lighting of good quality should be provided at all places where adequate natural light is not available or is insufficient.

9.2 Every abattoir shall be so constructed that meat inspection may be carried out in daylight. Sockets for the use of inspection lamps shall be provided at convenient places.

9.3 Every abattoir shall be provided with well-distributed artificial light of an overall intensity of not less than 220 lux throughout the slaughter hall and workrooms and at places where meat inspection is carried out, the overall intensity of artificial light shall be not less than 540 lux. The overall intensity of artificial light shall be not less than 110 lux in other areas.

9.4 Every abattoir shall be provided with suitable and sufficient means of ventilation to the outside air. The construction of the slaughter hall should be so arranged that the dressed carcasses are not exposed to direct sunlight.

10 SUPPLY OF WATER

10.1 A sufficient and constant supply of potable water (*see* IS 10500) shall be available at adequate pressure throughout the premises.

10.1.1 The pressure for the general purpose of floor washing, etc, may preferably be 30 psi to 50 psi for thorough floor cleaning.

10.1.2 For thorough and efficient washing of carcasses, a higher pressure of 150 psi to 250 psi is recommended.

10.1.3 Floor washing point may be provided preferably for minimum 37 m^2 on slaughter floor and working departments.

10.1.4 The water distribution plant may be located at the load centre.

10.2 A constant supply of clean hot water shall be available in the slaughter hall and workrooms during working hours.

10.2.1 Hot water is required at not less than 82°C for frequent sterilizing of equipment.

10.3 Every sanitary convenience in an abattoir shall be supplied with water by means of suitable flushing appliance.

10.4 Suitable facilities for washing of hands (including adequate supplies of hot and cold running water, nail brushes and soap or other detergent) shall be provided for persons working in an abattoir. Where non-potable water is used for fire control, steam production and cooling refrigeration equipment, etc, it shall be carried in completely separate lines preferably identified by colour and with no cross-connection or back siphonage with lines carrying potable water.

10.5 Water Requirement

10.5.1 Water requirement for an abattoir for pigs is approximately 454 litre/animal/day.

10.5.2 Water requirement for an abattoir for cattle is approximately 272 litre/animal/day.

10.5.3 Water requirement for an abattoir for sheep and goat is approximately 45 litre/animal/day plus 25 percent at a reasonable pressure of 15 psi.

10.6 Water should be tested once in a month for bacteriological requirements and once in six months for chemical requirements (*see* IS 10500). The abattoir owner shall keep meticulous records of the results of bacteriological and chemical tests.

11 EQUIPMENT CONSTRUCTION

11.1 Basic Equipment Required for Slaughter and Dressing

11.1.1 The basic equipment that is needed for the slaughtering operation consists of (The list is for guidance only, type and quantum of equipment will depend on the slaughtering procedures employed):

a) Stunning gun, electrical head tongs or simple stunning equipment for direct blow,
b) Knives - sticking (16cm sharpened on both sides), skinning (16cm curved),
c) A sharpening steel,
d) Sharpening stone,

e) Scabbard and belt for holding knives,
f) Meat saw (hand or electric) and cleaver,
g) Shackle or chain hoist strong enough to hold the weight of the animal to be slaughtered,
h) Skinning rack (dressing cradle),
j) Overhead rail system/strong beam, tripod or track 2.4 - 3.4 m from the floor,
k) Spreader-gambrel or metal pipe,
m) Buckets,
n) Working platforms,
p) Wire mesh aprons, and
q) Protective clothing for meat handlers/workers.

11.1.2 The following additional equipment are required when pigs are scalded and scrapped rather than skinned:

a) Scalding barrel or tank;
b) Pot, barrel or system for boiling water;
c) Bell scrapers/Dehairing machine;
d) Solid scraping table or platform;
e) Thermometer;
f) Hooks/Gambrels; and
g) Torch or flame gun.

11.1.3 Other/miscellaneous useful equipments include,

a) mechanical/electrical stunning equipment;
b) bleeding hooks (for vertical bleeding);
c) blood collecting trough; and
d) wash trough (for tripe).

11.1.4 The following items are necessary for sanitation of hands and tools:

a) Hand wash-basin, and
b) Implement sterilizers.

11.2 Excepting such equipment as utility boards, other equipment shall be constructed either of rust-resisting metal such as stainless steel or galvanized metal with smoothness of high quality commercial hot dip. The galvanized metal is generally not desirable where high resistance to corrosive action of food products and cleaning compounds is required. Plastic may be used. In that case plastic shall be abrasion- and heat-resistant, shatter-proof, non-toxic and should not contain, any constituents that may affect the meat or meat products during contact.

11.3 Accessibility for Cleaning and Maintenance

11.3.1 All parts of the product zone shall be readily accessible to sight and reach for cleaning and inspection.

11.3.2 Where necessary for proper cleaning and inspection, equipment shall be easily demountable. To facilitate this dismantling, quick opening devices that require no tools or, such simple tools as a mallet and an open-end wrench shall be provided. Bayonet joints, butterfly clamps, spring bolts, and other similar devices are desirable for connecting or closing parts of equipment. Where parts should be retained by nuts and bolts, the design shall provide for fixed studs with wing nuts, rather than bolts to a tapped hole.

11.3.3 All bearings shall be located outside the product zone and if adjacent thereto, shall be constructed with a readily removable seal at the entrance of the shaft, into the product zone.

11.3.4 Interior corners of equipment shall be provided with radii (minimum 6 mm), except where greater radii are required to facilitate drainage and cleaning.

11.3.5 All welding within the product zone shall be continuous, smooth, even and relatively flush with the adjacent surfaces.

11.3.6 All parts of the product zone shall be free of recesses, open seams and gaps, crevices, protruding ledges, inside threads, inside shoulders, inside bolts or rivets and deal ends.

11.3.7 Where necessary for sanitary maintenance, equipment shall be constructed and installed so as to be completely self-draining.

11.3.8 Care shall be taken to prevent contaminating product by lubricants used in overhead motors, gears, and similar devices. If drip pans are necessary, they should be easily accessible for inspection and removable for cleaning.

11.3.9 The safety or gear guards shall be readily removable for cleaning and inspection.

11.3.10 All external surfaces that do not contact with food products shall be free of pen seams, gaps, crevices and inaccessible recesses.

11.3.11 For elimination of fatigue and comfortable working for labourers the working table should be at waist height of the worker to work in standing position. If the table is at more height (that is 800 mm to 860 mm) it should have a platform incorporated for the balance height above 860 mm.

11.3.12 Working platform for on-the-rail operations should be of such height that the slaughter man has neither to stoop too low or stretch himself to his operation zone, and he should be able to reach operation zone in his natural standing position.

11.4 Non-acceptable Materials

The following materials shall not be used in an abattoir:

a) Copper and its alloys in equipment used for edible products;

b) Cadmium in any form in equipment handling edible products;
c) Equipment with painted surface in product zone;
d) Enamel containers or equipment is not desirable; and
e) Lead.

12 INSTALLATION

Following points should be strictly observed during installation of equipment from hygiene and sanitation point of view:

a) All permanently mounted equipment shall either be installed sufficiently away from walls (minimum 300 mm) to provide access for cleaning and inspection, or should touch the walls.
b) All permanently mounted equipment shall either be installed sufficiently above the floor (minimum 300 mm) to provide access for cleaning and inspection or be completely sealed (watertight) to the floor area.
c) Wall-mounted cabinets and electrical connections (such as switch boxes, electrical control panels, and BX cables) shall be installed at least 25 mm from equipment or walls or shall be completely sealed to the equipment or walls.
d) All tables or other equipment having water on the working surface shall be provided with turned-up edges. The height of the turned-up edge depends on the volume of water used and the operations conducted. In no instance should the turn-up be less than 25 mm.

13 SANITATION AND CLEANING

13.1 Cleaning

13.1.1 However, it is important to implement procedures which are applicable to the processing area being cleaned taking into consideration the nature of contaminants, type of detergents and method of cleaning.

13.1.2 *Nature of Contaminants*

Most of the contaminants in a abattoir are fat or protein, lubricants, vermin, bone chips, manure, bristles, hair, skin, tissue, spilled chemicals.

13.1.3 *Cleaning Techniques*

Depending upon the requirement any of the following types of cleaning can be used:

a) Manual cleaning,
b) Mechanical cleaning,
c) High pressure cleaning,
d) Moist steam cleaning, and
e) Foam cleaning.

13.2 Sanitation Measures

13.2.1 *Dry Clean*

Removing all pieces of meat, fat and other product residues.

13.2.2 *Soaking*

Small pieces/parts of equipment can be soaked in a tank of water and detergent. Large equipment, floor and walls can be foamed.

13.2.3 *Physical Cleaning*

After soaking, equipment is cleaned manually, using a brush or mechanically using high pressure or steam cleaning. Manual scouring to remove protein crusts and adhesive layers.

13.2.4 *Rinsing*

Thorough hose down with warm water to remove detergent residues, contamination.

13.2.5 *Drying*

Excess water should be removed from horizontal surfaces by wiping with paper towels or scraping with scrubbers.

13.2.6 *Sanitation*

Sanitizing agents may be applied as spray or mist, immediately after post cleaning rinse until next day’s production.

13.2.7 *Pre-operation Hose Down*

This serves to remove sanitizer residues and to rinse off contamination.

13.3 Detergents

13.3.1 Any detergent formulation may contain 2 to 15 components which may belong to the following categories:

a) *Alkalis* — caustic soda, caustic potash, carbonate, silicate, phosphate.
b) *Acids* — phosphoric, nitric, citric, glycolic, sulphamic, hydrochloric.
c) *Chelating agents* — EDTA, NTA, gluconate, glucoheptonate, citrate.
d) *Solvents* — isopropanal, propylene glycol, butyl diglycol, ethers.
e) *Surfactants* — anionic (Ammonium lauryl sulphate), Cationic (quartz-quaternary Ammonium compounds) non-ionic, amphoteric.

f) *Inhibitors* — organic, (sodium benzoate). Inorganic, (sodium nitrite, sodium Chromate).
g) *Enzymes* — protease, lipase, amylase.
h) *Oxidizing agents* — hypochlorite, Isocyanurates, Dichlor, Stabilised Chlorine dioxide, hydrogen per oxide.
j) *Stabilizers* — Cynuric acid.
k) Viscosity modifiers.

13.4 Water to be used for cleaning and washing should be potable (*see* IS 10500). Water should be tested once in a month for bacteriological requirements and once in six months for chemical requirements (*see* IS 10500). The slaughter house/abattoir in charge must keep meticulous records of the results of bacteriological and chemical tests.

13.5 Microbial standards for surfaces in contact with products are as follows:

a) *Thorough clean surfaces*:

Total viable count (TVC)	:	less than 10/cm^2
Coliform count	:	0

b) *Clean surfaces*:

Total viable count (TVC)	:	less than 50/cm^2
Coliform count	:	0

c) *Surface in use*:

Total viable count (TVC)	:	less than 1 000/cm^2
Coliform count	:	0

14 PLANT WASTE WATER DISPOSAL

14.1 An efficient method of disposing of plant wastes should be provided. If permitted by local bye-laws, the plant waste may be discharged after proper treatment into a municipal sewer system, as this is most desirable. If a private septic tank or sewage disposal system is used, it shall be efficiently designed and operated so as not to produce objectionable conditions on or near the official premises. Normally, for removal of grease and manure catch basins and vibrating screen with hopper, respectively, should be provided.

14.2 Catch Basin for Grease Recovery

Catch basin for the recovery of grease should be suitably located and not placed in or near edible products department or area where edible products are unloaded from or loaded on to vehicles, To facilitate ready cleaning, such basins should have inclined bottoms and should be without covers. They should be so constructed that they may be completely emptied of their contents for cleaning. A hose connection for furnishing hot water for cleaning purposes should be provided at convenient locations near the basin. The area surrounding an outside catch basin should be paved with impervious material, such as concrete, and provided with suitable drainage facilities. Suitable facilities should be provided for the transfer of grease to the point of disposal after it is skimmed from the basins by mechanical or other means.

14.3 Manure Removal

A separate drain line for water containing manure should be provided. This waste water may be pumped by wet pit or dry pit to non-clog pumps and manure screened out and disposed of by mechanical or the other suitable means. Some consideration as in catch basin should be given for location of this plant.

14.4 Buildings, manure and silos should be located in a way that minimizes their harmful influence on the environment; pollution of water sources by the slurry and manure should be prevented. Tanks for the collection of effluent and pre-purification plants must be situated at the lowest point of the site, on the dirty side.

15 SAFETY REQUIREMENT

There shall be adequate fire fighting arrangements and portable first aid fire appliances shall be fixed in accordance with IS 2190.

16 MEAT WORKERS/HANDLERS

16.1 Person possessing valid license or certificate by the municipality/corporation or local authority should be employed in an abattoir. The license should be renewed once in two years after medical examination of the person.

16.2 Persons below the age of 18 years and above 58 years should not be employed.

16.3 Person suffering from communicable infectious/contagious diseases should not be employed either to slaughter or work in the abattoir.

16.4 Daily routine health check up of all meat workers for cough/cold/fever/wounds should be done while entering the abattoir.

16.5 Wrist watches, gold/silver ornaments, flowers should not be worn and mobile phones and perfume should not be used in the slaughter/processing area.

16.6 All meat workers, both male and female should cover their head and trim their nails and wear proper clothing, hand gloves and gum boots to ensure hygiene.

16.7 When returning from an illness, management must demand a medical certificate from that person indicating that they have no impediment to return to work. (This is to prevent such a person contaminating the product with pathogenic microorganisms.)

16.8 A person with an open cut or abrasion should not handle the product unless the cut is completely covered with a coloured, waterproof covering.

16.9 All personnel working in the abattoir should maintain their own personal cleanliness.

16.10 Protective clothing includes light coloured overalls or a coat and trousers, chain mail gloves and aprons (where applicable), footwear and hair/snood coverings.

16.11 All personal belongings and clothing should be stored in an area away from the abattoir, in designated lockers.

16.12 Smoking and eating and/or drinking are not permitted in the production area.

16.13 Hand washing should be conducted on entering and leaving the abattoir, immediately after finishing any task that involved contact with intestinal contents/ faecal material on the carcasses and after using the toilet facilities.

16.14 The access of visitors should be controlled to prevent contamination.

16.15 All necessary precautions should be taken to prevent cross-contamination, including the use of protective clothing, hair covering and footwear by all visitors.

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BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.org.in

Regional Offices: *Telephones*

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002 — 2323 7617, 2323 3841

Eastern : 1/14 C.I.T. Scheme VII M, V. I. P. Road, Kankurgachi KOLKATA 700054 — 2337 8499, 2337 8561, 2337 8626, 2337 9120

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022 — 260 3843, 260 9285

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113 — 2254 1216, 2254 1442, 2254 2519, 2254 2315

Western : Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093 — 2832 9295, 2832 7858, 2832 7891, 2832 7892

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